

Entry Deterrence in the RTE Cereal Industry

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WP961-77

December, 1977

* This paper reports on analysis performed for and supported by the Bureau of Economics of the U.S. Federal Trade Commission. Many of its central points were made in memoranda to the Bureau in 1973 and 1974 and in my testimony in the cereals case (FTC Docket 8883, transcript pages 21671-23935). Throughout my association with the FTC, I have profited from working closely with Michael Glassman. His searching criticisms and helpful suggestions have been of great value. I am also indebted to many other current and former members of the commission staff, including Lawrence Bernard, William Burnett, James Green, Anthony L. Joseph, David Malone, Frederic M. Scherer, and Catherine Winer. Robert Willig provided useful comments on an earlier version of this essay, when it was presented at Bell Laboratories in February, 1977. Correspondence with Curtis Eaton has been helpful. In spite of this long list of suppliers, any shortcomings of the present paper are entirely the author's responsibility, and this essay does not necessarily reflect the views or assumptions of any other individual or organization.

ABSTRACT

This paper presents an analysis of the ready-to-eat breakfast cereal industry based on and related to the current antitrust case involving its leading producers. A spatial competition framework is employed, with brands assumed relatively immobile. It is argued that the industry's conduct, in which price competition is avoided and rivalry focuses on new brand introductions, tends to deter entry and protect profits. Entry into a new segment of the market in the 1970's is discussed. Relevant welfare-theoretic issues are analyzed, and it is argued that the remedy proposed by the FTC is likely to improve performance.

I. INTRODUCTION AND BACKGROUND

In April, 1972, the U.S. Federal Trade Commission issued a complaint charging violations of Section 5 of the Federal Trade Commission Act against the four largest U.S. manufacturers of ready-to-eat breakfast cereal (hereinafter simply RTE cereal): Kellogg, General Mills, General Foods, and Quaker Oats.¹ In a section headed "Brand Proliferation, Product Differentiation and Trademark Promotion," the complaint discussed the brand introduction and sales promotion activities of these firms and charged that "These practices of proliferating brands, differentiating similar products and promoting trademarks through intensive advertising result in high barriers to entry into the RTE cereal market." The complaint did not describe the mechanism through which such conduct was alleged to impede entry.

The trial stemming from this complaint began in April, 1976. As this is written (fall, 1977), that trial seems far from over.

This essay presents the analysis of entry conditions in the RTE cereal market upon which the author's testimony as a government witness in that trial was based.² It takes as given certain factual points that complaint counsel have sought to establish (on the basis of evidence generally restricted to the pre-complaint period). There is little point in debating controversial issues of fact outside the courtroom until the record in this case is complete. Still, an indication of the economics of the government's position in this potentially important antitrust action may be of interest. Further, the analysis that follows develops and applies a number of ideas that have appeared in the theoretical literature, and it may have implications for the study of other industries.

Some key factual points are stated below. Section II then presents and discusses three important features of the RTE cereal industry that serve as assumptions in the analysis that follows. In Section III, these assumptions are applied

to static analysis of entry deterrence, under the assumption commonly made in theoretical work that established sellers can arrange their affairs once and for all in anticipation of possible entry. Section IV relaxes this assumption and considers the dynamics of seller conduct and entry deterrence in the RTE cereal industry. Some welfare-theoretic implications of the analysis are discussed in Section V, and the likely impact of the government's relief proposals is evaluated in their light in Section VI.

The production of RTE cereal has been highly concentrated throughout the post-war period, with the four respondent firms generally accounting for at least 85% of sales and the top six firms generally capturing at least 95% of the market. Sales of RTE cereal grew rapidly and fairly steadily from 1950 until the mid 1960's. Relatively slow growth was experienced in the latter part of that decade, though rapid growth seems to have returned in the early 1970's. From 1940 until the early 1970's, no new producers of RTE cereal attained non-negligible market shares. In the early 1970's, however, several large firms entered the industry and began national marketing of so-called natural cereals.

It appears that the leading sellers generally received very high profits from their RTE cereal operations, even after due allowance is made for biases in accounting measures of rates of return.³ Since observed variability in sales and profits of leading firms does not seem unusually great, and accounting rates of return remained high during the late 1960's, these profits do not seem explicable as compensation for risk bearing.

Given the industry's growth and profitability, the lack of noticeable entry by new firms over a long period implies the existence of some impediment or barrier to entry.⁴ Any explanation of the lack of entry of substantial new firms must be consistent with the frequent introduction of new brands by established sellers.

Between 1950 and 1972, the six leading producers introduced over 80 brands into distribution beyond test market. The total number of brands in distribution beyond test market rose from about 25 at the start of 1950 to about 80 at the end of 1972. Further, any explanation of the lack of significant new firm entry during the 1950-1970 period must also be consistent with the subsequent entry of new firms in the natural cereal area in the early 1970's, relatively soon after a slackening in overall demand growth.

In order to see the analytical problem more clearly, it will be useful to consider industry attributes generally thought to be relevant to conditions of entry.⁵ The best available evidence suggests that the minimum efficient firm size in this market, as of the mid-1960's, involved a 3-5% market share. Scale economies of this magnitude would not seem sufficient to explain the prolonged persistence of very high profits, nor is any explanation based on them easily reconciled with the entry of the 1970's.⁶ Neither patents nor ownership of raw materials sources are important in this industry. Brand-specific production knowhow is apparently present, since established firms are sometimes unable to duplicate each others' brands. But this has not prevented any of them from producing, promoting, and distributing successful new brands. The products in this market are clearly differentiated, and advertising-sales ratios have generally exceeded 10% in the post-war period. But it is again hard to reconcile an important barrier based on advertising or differentiation per se with the new brand and new firm entry that did occur. (It should also be noted that company name has not always received great stress in the established firms' advertising.)

Finally, the absolute capital costs (including product development and introductory advertising) of efficient entry have been estimated to be in the \$80-150 million range in the early 1970's. Neither this cost nor any of the other factors mentioned in the preceeding paragraph would seem sufficient to explain the lack of

entry into this market during the 1950-1970 period by large, diversified food processing firms, some of which (Pet and Colgate, for instance) entered in the early 1970's. In any case, this conclusion will be assumed to be correct in what follows. (It is, of course, not accepted by the four respondent firms in the current FTC proceeding.)

II. BASIC ASSUMPTIONS

This section describes a conceptual framework suitable for analysis of the RTE cereal market and, it would seem, at least some other markets in which product selection is an important element of conduct. The three component assumptions of that framework are (1) increasing returns at the brand level, (2) localized rivalry among brands, and (3) relative immobility in product space at the brand level. These will be described and discussed in turn.

Increasing returns It will be assumed that for individual brands, at least at low levels of output, the unit cost of production and marketing falls with increases in output. As writers from Chamberlin [1959] to Spence [1976a] have observed, a range of increasing returns in the production and marketing of individual brands of differentiated products is both technologically plausible and necessary to account for the observed structures of such markets. Without such a range of increasing returns, for instance, each consumer in the country would be able to purchase (or, for that matter, to manufacture) at reasonable cost one or more brands of RTE cereal tailored exactly to his or her tastes. In fact, as of the late 1960's, individual brands of RTE cereal tended to be considered viable only if they captured around 1% of the market.

A common simplifying assumption in this context, both in studies concerned with differentiation by location (e.g., Eaton and Lipsey [1976a]) and in those focusing on product differentiation more generally (e.g., Spence [1976a]), is that

the long-run total cost of producing and marketing a typical brand is given by

$$(1) \quad C(q) = F + vq,$$

where F and v are positive constants, and q is the output of the brand. This cost function will be employed for illustrative purposes below; it is merely the simplest functional form that exhibits increasing returns.

The appropriate interpretation of "long-run total cost" or of equation (1) in the RTE cereal context requires comment. There are presumably increasing returns in the production of RTE cereal brands, at least at low levels of output. Marketing costs are substantial in this industry, and it would appear that there are also increasing returns in marketing over a brand's life cycle. As the RTE cereal market has operated in recent decades, new brand launchings have required substantial initial outlays for advertising (and, possibly, for research and development as well). It is often asserted that introductory promotional activity can "buy" trials, but that only satisfaction with a produce can generate repeat sales. Buyer satisfaction clearly cannot be precisely predicted: if it could be, no new brands would ever fail. It follows that costs of introductory advertising for any single brand are at least to some extent independent of its subsequent sales. Even after a brand has been launched, some advertising spending must have the intended effect of "buying" first purchases, especially from new RTE cereal buyers and those consumers whose personal life-cycle status has changed. If, for purposes of long-run analysis, the brand life cycle is collapsed to a single point in time, introductory advertising costs and some fraction of later advertising outlays may be treated to a first approximation as corresponding to some of the fixed cost, F , in equation (1).

It is very important to keep in mind, however, that the level of spending required to launch a new RTE cereal or to produce any given number of initial trials after launch is not independent of the level of advertising for other brands nor,

in general, of the whole pattern of conduct in the industry. The more intensively brand A is advertised, the harder it must be, ceteris paribus, to persuade consumers to try a similar brand B. In terms of our illustrative equation (1), the level of F is determined both by technology and by seller conduct in the industry. We return to this point below.

Localized Rivalry Since Hotelling's [1929] classic study, models of spatial competition have frequently been applied to study situations in which, as Lovell [1970, p. 121] puts it, "variations in consumer taste give rise to product differentiation."⁷ While consumers do not have perfect information about RTE cereals, imperfect information does not seem to be the major reason why products are not perceived as identical. In fact, individual RTE brands do differ physically in perceptible ways, and the spectrum of available brands seems clearly to reflect attempts to appeal to individuals with diverse tastes.

In Hotelling's [1929] model, a large number of small buyers are assumed to be distributed uniformly along a finite line segment. Hotelling suggests that one can imagine distance along that segment as indicating the sweetness of cider, so that an individual buyer's location corresponds to the exact degree of sweetness he likes best. In the Hotelling model, if all prices are equal, each consumer buys one unit of the brand of cider that is most like his preferred type by patronizing the brand closest to his location on the line. If there are several active sellers on the line, and if individual buyers take into account both prices of and distances to these sellers in determining how much to purchase and which seller to patronize (as most subsequent authors have assumed), then small changes in any brand's price are only felt by its two closest neighbors on the line.⁸ That is, each individual brand of cider competes only with the closest brand on the right (the sourest of the sweeter brands, say) and the closest brand on the left (the sweetest of the sourer brands, say). In this framework, competitive effects are

localized. Even though there may be many brands on the market, each brand is effectively an oligopolist, since small price or location changes will have noticeable impacts on only a small number of rival brands.

In contrast, in the symmetric model usually associated with Chamberlin [1962], the effects of any single brand's competitive actions are assumed to have roughly equal impact on each and every other brand on the market. In an important early discussion of Chamberlin's [1962] work, Kaldor [1935] strongly criticized the symmetric model, arguing that the spatial view generally corresponded more closely to reality.⁹ Papers by Lerner and Singer [1937], Copeland [1940], and Smithies [1941] analyzed and extended Hotelling's [1929] original spatial model; all argued its general applicability to markets with differentiated products. By the early 1950's, Chamberlin [1951, 1953] had explicitly accepted the spatial model as a useful tool, and he seems to have recognized clearly that it implies localized rivalry and thus makes oligopolistic interaction the norm (c.f. Chamberlin [1951, p. 68]).

In recent years, a large number of authors have studied spatial models and have indicated that they cast light on differentiated markets in general. Tullock [1965], Telser [1969, 1971], Lovell [1970], Peles [1974], Hay [1976], Eaton and Lipsey [1976b, 1976c] and Prescott and Visscher [1977] have assumed buyers to be distributed along a line, a la Hotelling [1929].¹⁰ Stern [1972], and Eaton and Lipsey [1975] have considered both that assumption and situations in which buyers are distributed over a plane. Samuelson [1967], Willig [1973], and Salop [1976] have followed Chamberlin [1953] and analyzed models in which buyers are distributed uniformly around a circle.¹¹

An attractive, but not yet well-developed alternative to the spatial model is Lancaster's [1966, 1971] "characteristics" approach to demand analysis.¹² That approach assumes that various products or brands are valued by consumers entirely because they provide certain attributes or characteristics, so that demand for

products is really derived from the underlying demand for characteristics. Brands differ in the amounts of the various characteristics they supply.

As the analyses of Baumol [1967], Lancaster [1975], and Salop [1976b] have shown, the formal correspondence between Lancasterian models with two characteristics and one-dimensional spatial models is almost exact.¹³ In particular, the same localization of competitive effects is preserved; small changes in the price or attributes of a single brand generally effect two and only two rival brands.

Archibald and Rosenblith [1975] have further shown that this sort of localization is preserved in models with three characteristics. But in Lancasterian models with four or more characteristics, the theoretical possibility emerges that the average brand might have a large number of direct competitors; general theoretical conditions that either guarantee or rule out this possibility are apparently not yet known.

It seems likely that RTE cereals provide at least four different attributes relevant to consumers. Existing brands differ in such potentially relevant dimensions as sweetness, protein content, shape, grain base, vitamin content, fiber content, and crunchiness, for instance. The results of Archibald and Rosenbluth [1975] would then seem to imply that the reasonability of the localization assumption in this market is an empirical question. (As it must be in most differentiated markets.) The weight of the evidence seems to me to support it. (This is a judgement with which respondents in the FTC action do not seem to agree.) A good deal of marketing analysis in the industry is done in terms of segments, which are treated as clusters of more directly competitive brands. Further, analysis often proceeds in explicitly spatial terms, with discussions of clusters of brands, open spaces, and of close and distant competitors. Marketing plans for individual brands tend to place greatest stress on the actions of only a few rivals.

In what follows, it will be assumed that rivalry among brands is localized. That is, it will be assumed that actions relating to any single brand will generally have important effects on only a small number of other brands. Because models of spatial competition have been intensively studied and often applied to situations of this sort, it will be convenient to use the spatial framework to indicate the implications of localization. Thus, individual brands can be thought of as having locations in economic or product space that correspond to the collections of attributes that consumers perceive them to possess. Consumers' locations in this same space then correspond to their most preferred (potential) brands. The simplest specific structure of this sort arises when buyers can be thought of as uniformly distributed around a circle. If there are at least two established brands, any new brand must be positioned between two such brands. In the circular model, localization is present in an extreme (and thus tractable) form: normally only the two brands between which an entrant locates would be affected by changes in, for instance its price.¹⁴

Relative Immobility If the relevant economic space is in fact geographic space, so that brands differ only in the locations at which they are available, it is clear that changes in location are rarely costless. New quarters must be located, equipment must be packed, moved, and unpacked, and customers must be informed of the move. Similarly, it is not generally costless to change brands' locations in the space of consumer perceptions of attributes provided. There may be costs associated with redesigning the product and retooling to produce a slightly different commodity. Even if a brand's location in product space can be altered by changing buyer perceptions without varying the physical characteristics of the good, such changes must require special advertising effort. (At the very least, a new campaign must be designed and prepared.) The existence of such "repositioning costs" is well recognized in the marketing literature; see, for instance, Kotler [1976, pp. 168-9].¹⁵

In his pioneering analysis of the spatial model, Hotelling [1929] was somewhat vague about brand mobility. The early studies of Lerner and Singer [1937] and Smithies [1941] allowed all brands on the market costlessly to vary locations simultaneously. They sought, under various behavioral assumptions, equilibria in which no further adjustments were profitable. It is surely rather difficult to imagine markets, with geographic or other differentiation, to which such models might apply. Moreover, such models have rather serious internal difficulties: see, e.g., Eaton and Lipsey [1975] and Shaked [1975]. A second path of development, followed if not begun by Copeland [1940], makes the other extreme assumption that brands' locations, once chosen, are irrevocably fixed. This assumption has been explicitly made in discussions of brand entry by Tullock [1965], Peles [1974], Eaton and Lipsey [1976b], Hay [1976], Rothschild, [1976], Salop [1976] and Prescott and Visscher [1977]; it is clearly implicit in the discussions of Baumol [1967] and Archibald and Lipsey [1975].¹⁶ Tullock [1965] and Eaton and Lipsey [1976c] discuss the consequences of relaxing this extreme assumption to permit movement with finite costs.

I have seen nothing that suggests that RTE cereal producers have the exceptional ability to shift brands' locations in economic space without substantial cost. In fact, established brand names are often dropped entirely when sales fall to low levels, while at the same time new brands are being introduced. If the cost of moving an old brand to an arbitrary location were less than the cost of introducing a new one, this would not be observed. The history of the industry contains a number of instances of successful and unsuccessful attempts to reposition brands; these generally involved substantial costs.

For simplicity, it will generally be assumed in what follows that brands' locations cannot be changed. But it should be clear in context that replacing this with the assumption of substantial (but finite) repositioning costs would not affect the qualitative nature of our conclusions.

III. STATIC THEORY OF ENTRY DETERRENCE

I first want to argue that the assumptions made above imply the existence of situations in which established brands earn excess profit, but no potential entrant (or established firm) finds it attractive to launch a new brand. Familiar difficulties are encountered in attempts to prove this point mathematically. Under localization, the appearance of a new brand would have noticeable effects on only a small number of established brands. A potential entrant's expectations about the reactions of these few rivals must be central to his assessment of the attractiveness of entry. But it is generally recognized that there exist no simple, generally plausible models of the formation of expectations about rivals' reactions in such oligopoly situations.

On the other hand, numerous analyses that consider particular spatial structures and make more or less plausible assumptions about entrants' expectations have found that entry may not suffice to eliminate excess profit. Copeland [1940, pp 8-9] provides an early example. More formal descriptions of profitable situations immune to entry may be found in studies of spatial competition by Vickrey [1963], Beckman [1968], Lovell [1970], Peles [1974], Eaton [1976], Eaton and Lipsey [1976a, 1976b, 1976c], Hay [1976], Salop [1976], and Prescott and Visscher [1977]. The main feature of all these analyses can be illustrated by a simple example that also serves to introduce some useful apparatus.

Consider a situation in which buyers are uniformly distributed around a circle of unit circumference. Let there be N established brands, located distances $(1/N)$ apart around the circle, all charging the same price, p . For simplicity, suppose that all potential entrants face expected demand curves with sharp kinks at this price. That is, they feel that established rivals would not match prices above p , and no such price would be superior to p . On the other hand, they expect prices

below p to be rendered unattractive by drastic retaliatory price cuts by established brands. Any new entrant would thus charge p . Let costs be given by equation (1), and suppose that brands' locations cannot be changed. As is usual in such models, when all brands charge the same price, each buyer is assumed to patronize the closest brand.

Let the demand for any particular brand by those who patronize it and who are located at distances between x and $(x+dx)$ from it along the circle be given by $a(p)(1-\alpha x)dx$, where $a(\cdot)$ is decreasing, with $0 \leq \alpha \leq 2$.¹⁷ The larger is α , the more sensitive total market demand is to the variety of brands offered. When brands differ only in geographic location, it is natural to write demand as a decreasing function of delivered price, say $(p+cx)$ with c some constant. But unless differentiation is explicitly and entirely geographical, this standard assumption has no compelling justification.¹⁸ It is defended entirely by analogy. The multiplicative separability assumption introduced here has the convenient property that in symmetric situations, the elasticity of total demand with respect to price (number of brands) is unaffected by the number of brands (level of price). While the cross-effects thus assumed away may be important in some cases, it is not obvious which way they run. It is far from obvious that the assumptions about these effects implicit in the use of the delivered price model are sensible in other contexts.

If a particular brand is patronized by buyers located as far as d away on its "right" and on its "left," its total demand is given by

$$(2) \quad \int_0^d a(p)(1-\alpha x)dx = a(p)(2d-\alpha d^2).$$

With N evenly-spaced established brands, each brand is closest for buyers located up to half the distance to its rivals on either side. Since these are each $(1/N)$ away, $d = 1/2N$ in this case. The demand for a typical brand in a market with N evenly-spaced brands all charging price p is thus obtained from (2) as

$$(3) \quad q(p, N) = a(p)(4N - \alpha)/4N^2.$$

Let $A(p) = (p-v)a(p)$, with p assumed greater than v . Then if costs are given by (1), the profits of a typical established brand are

$$(4) \quad \pi(p, N) = A(p)(4N - \alpha)/4N^2 - F.$$

Suppose that $A(p) > 4F/(4 - \alpha)$, so that a single isolated brand would be profitable, and neglect the requirement that N be integer. Fix p and let \bar{N} be the value obtained by setting $\pi(p, N) = 0$ and solving. All established brands are then profitable as long as $N < \bar{N}$.

An entrant must locate next to an established brand or somewhere between two established brands. It is easy to show that on the assumptions above, the entrant always does best by locating exactly in the middle of any open interval.¹⁹ Such an entrant's sales will be made only a distance $1/4N$ to the left and $1/4N$ to the right -- halfway to the nearest rival brands, the locations of which he must rationally assume fixed. Total demand for the new brand will be $q(p, 2N)$, repeating the development leading to equation (3). It then follows that the entrant's profits will be positive only if N is less than $\bar{N}/2$. Hence, as long as $\bar{N}/2 < N < \bar{N}$, all existing brands earn positive profits, but any entrant would suffer losses.

The detailed features of this example obviously depend on some rather strong simplifying assumptions, but the general principles it illustrates do not, as discussions in the papers cited above and by Kaldor [1935] and Tullock [1965] make clear. It has been familiar since at least Bain [1956] that a range of increasing returns can by itself lead to profitable equilibria immune to entry. The assumptions of localized rivalry and relative immobility serve to magnify the effect of this nonconvexity, as Eaton and Lipsey [1976b] note. Under localization, entry imposes a noticeable increase in crowding in the relevant portion of economic space,

regardless of conditions elsewhere. (In one-dimensional models, two-firm situations become three-firm situations.) Under restricted mobility, an entrant cannot expect existing brands to make room for him by changing their locations, so that the initial crowding he must create must be expected to persist.

In the example above, for instance, it can be shown that the post-entry profits of the N established brands are maximized after entry (with price still fixed) by moving to a configuration in which all $N+1$ brands are evenly distributed around the circle. If mobility were not restricted, a potential entrant might come to expect that such repositioning would follow the appearance of his new brand. But he would then expect profit given by $\pi(p, N+1)$, and deterrence would be effective only for $(\bar{N}-1) < N < \bar{N}$. That is, if 80 brands would yield zero profit, entry would be induced with fewer than 79 brands. With relocations (correctly or incorrectly) perceived as impossible by potential entrants, however, entry does not become attractive until N falls below 40. The possibilities for excess profits are obviously greatly enhanced in the latter case.

I now want to go one step further and to suppose that established sellers collude in order to deter entry at minimum cost to themselves. Two situations will be compared: the unconstrained monopoly equilibrium, and the result of maximizing total profit subject to the constraint that entry by brands with equivalent costs be deterred. I will argue that optimal deterrence under our three basic assumptions is likely to be obtained mainly by increasing the number of brands, rather than by any sort of limit pricing policy. In addition, established firms may find it to their advantage to increase promotional outlays in the face of threatened entry.

Let us begin with a simple illustrative formal model, which is a generalization of the circular structure considered above. Let the cost function (1) apply to all established and potential entrant brands. Let the actual or expected average sales

per brand when there are N brands optimally located in the market, all charging price p , be given by

$$(5) \quad q(p, N) = a(p)b(N),$$

where $b(\cdot)$ is decreasing, and $Nb(N)$ is non-decreasing and concave. This latter assumption simply implies that total sales of the product does not fall as the number of brands increases, but the market-expanding effect of each additional brand (even with all others optimally relocated) does not increase with the number of brands on the market. It is easy to see that (3) satisfies these conditions. (Note that $q(p, N)$ must be multiplicatively separable, as in (5), if total sales, $Nq(p, N)$ are independent of N .) Total profits of the established brands are then given by

$$(6) \quad V(p, N) = N\pi(p, N) = A(p)Nb(N) - NF.$$

Let the values of p and N that maximize this expression be p^m and N^m , respectively.

In the circular model, a price-matching entrant's maximal sales were $q(p, 2N)$. We can generalize this by supposing sales of such a brand to be $q(p, \gamma N)$, where γ is some constant greater than one, the exact value of which depends on the precise nature of the economic space and of the distribution of consumers therein. The profits that would be earned by a typical price-matching entrant brand are then

$$(7) \quad \pi(p, \gamma N) = A(p)b(\gamma N) - F.$$

The existing firms optimally deter a price-matching entrant by choosing p and N so as to maximize $V(p, N)$ subject to the constraint $\pi(p, \gamma N) \leq 0$.²⁰ Let the corresponding values of p and N be p^d and N^d , respectively. One might imagine two extreme forms of solution to this problem. In the first, $p^d < p^m$ and $N^d = N^m$. This is a limit pricing strategy, and, given the demand asymmetry and the assumption of price-matching, there must exist such a strategy that will deter entry with $V(p, N) > 0$.

The second extreme case will be termed a brand proliferation strategy: $p^d = p^m$, $N^d > N^m$. Under this strategy, deterrence is achieved entirely by crowding economic space. Section A of the Appendix shows that in fact the brand proliferation extreme is always optimal in this illustrative model. The (qualitatively identical) comparative static properties of the unconstrained monopoly and deterrence equilibria are outlined there as well.

Before discussing the implications of relaxing the special assumptions of this example, let us expand the model slightly to include advertising. The simplest way to do this in the present context is to consider only introductory advertising, and to use F as a proxy for introductory spending per brand. Suppose that established firms can choose F , and that level of spending will be matched by any potential entrant. If all brands spend F on advertising, let (5) be replaced by

$$(8) \quad q(p, N, F) = A(p)b(N)d(F)$$

where $d(\cdot)$ is increasing and strictly concave. This equation makes the elasticity of average brand sales with respect to average brand advertising independent of price and the number of brands. Strict concavity implies diminishing returns to advertising. Section B of the Appendix demonstrates that at a deterrence equilibrium, F is such that reductions in advertising would increase the profits of the established brands. The intuition here is that each brand's advertising expands sales in direct proportion to its market area. Since entrants are more crowded after entry than are established firms before entry, i.e., since $b(\gamma N)$ is less than $b(N)$, entrants would receive less payoff from each dollar of spending than do established brands. If entrants must match spending levels of established brands, it is generally in the latter's interest to forego some short-run profits in order to impose greater costs on potential entrants, and thus to increase the strength of the entry deterrent via advertising.

The foregoing analysis suggests that under our basic assumptions, the privately optimal entry deterrence strategy involves high prices, brand proliferation, and some degree of over-spending on advertising. That analysis rests on restrictive assumptions about behavior, of course, as do most formal analyses of small numbers situations. I now want to argue that those behavioral assumptions are not necessary for the conclusion. When potential entrants are sophisticated, the effectiveness of any entry deterrence strategy must depend on the credibility of the post-entry threat it is designed to convey. The threats implicit in the strategy described above are at least as credible as any others available.

Suppose, for instance, that established firms attempt to deter entry by some form of limit pricing.²¹ Suppose further that even though prices of all brands are held below the short-run profit maximizing levels, entry nevertheless occurs. Low prices of the brands directly competing with the entrant, having failed to deter its entry, then have no further purpose (as far as the market area occupied by the new entrant is concerned) except to inflict punishment on the interloper. But once the entrant has launched, his fixed costs are forever sunk, and he will continue to operate as long as price exceeds average variable cost: his brand is also more or less immobile. Because they have demand advantages, established brands may be able to force the entrant's price down to average variable cost without incurring substantial losses themselves. But this may well be an irrational strategy. Once the entrant is in place, both its profits and those of its immediate rivals can generally be raised by increasing price. As only a small group of firms is involved, and all have something to gain by raising price, one might expect price increases to occur in the vicinity of an entrant. Thus, potential entrants are likely to doubt that prices below the profit-maximizing level would be maintained after their entry. But if they come to doubt this to any extent, limit pricing ceases to be an effective deterrent even in principle, since low pre-entry prices cease to imply low

post-entry prices. In sum, if we give potential entrants credit for the ability to understand their post-entry position, the value of limit pricing as an entry deterrent declines.

To the extent that not all fixed advertising costs are associated with brand introductions, a similar argument applies to the use of excess advertising as an entry deterrent. Suppose we conceptually divide brands' advertising into introductory and maintenance spending. A brand's introductory spending is aimed at persuading buyers to try it the first time, while maintenance spending is aimed at those who have tried it in the past. Higher maintenance spending by established brands will raise the level of introductory spending an entrant must do in order to be noticed. After entry, however, potential entrants might well expect profit-increasing reductions in directly competitive maintenance spending, since, as before, only a small number of brands would be involved. Thus current levels of maintenance spending by established brands might not be persuasive indicators of the level of post-launch promotion in which an entrant must engage to maintain its position. The deterrent effect of excess advertising is thus weakened, but it is not eliminated, since spending levels of established firms need only be maintained during the period of launch in order to impose additional fixed introduction costs on an entrant brand.

There exist no similar arguments that weaken the case for brand proliferation's private optimality. An expressed threat to surround an entrant immediately with new brands controlled by established sellers would be a threat to engage in mutually damaging warfare. On the arguments above, it might thus lack credibility. But if the established firms can crowd economic space with brands before the threat of entry appears, as we have been assuming, the entry-detering threat is that the brands will not be moved if entry occurs. Since repositioning brands is assumed to involve substantial costs, such a threat is quite credible.²²

So far, it has been assumed that no potential entrant has a significant advantage over established firms. If an outsider has such an advantage, because of a major product or process innovation or superior marketing ability, for instance, its entry is obviously harder to deter in any reasonable model. If the advantage is great enough, deterrence may be impossible or unprofitable. In the appropriate dynamic context, however, it usually requires the investment of resources in some form of research or development to secure such advantages. The task of entry deterrence then involves persuading outsiders that such investments are not worth making. We return to this point in Section IV.

It has also been implicitly assumed so far that entrants would generally attempt to market brands perceived by consumers as different from those of established firms. In the RTE cereal context, one should also consider the possibility of entry by an aggressive private labeler, which would attempt to produce recognizable imitations of some established brands. It would not need to go through the usual introduction process, with its heavy advertising costs, and it would price its brands below those they imitated.²³ Since there are increasing returns at small levels of output for individual brands, such entry is most attractive when there are a few large brands that can be imitated, because it is then more likely that production efficiency will be attained. But if established firms have proliferated brands, the shares of leading brands will be relatively low. The market share an imitator of such a brand can hope to capture will be correspondingly reduced, and the attractiveness of private labeling thus diminished. It is hard to see how any form of limit pricing would be a powerful deterrent, as the arguments made above apply with a vengeance to a two-seller (the established brand and its imitator) situation. Heavy advertising might be effective, but only to the extent that it persuaded consumers that no private label product could be comparable to "the real thing" and thus inhibited trial of any private label brand. A brand proliferation strategy

thus appears to be a plausible and effective deterrent of private label entry as well as of "branded" entry.

The basic picture that emerges from this section is consistent with the implication of Hay's [1976, p. 253] theoretical analysis that "firms in a differentiated industry do not respond to the threat of new entry by lowering price, but rather seek to proliferate products to fill up those parts of quality space where there could be sufficient consumer demand to attract new entry." It is also consistent with Scherer's [1977] description of conduct in the cement and Swedish tobacco industries. In the latter case, removal of a government grant of monopoly status led to dramatic increases in the number of cigarette brands offered and in the level of advertising spending, as the firm sought to replace the entry barrier it had lost.²⁴

IV. APPLICATION TO RTE CEREALS

In the interests of tractability, perfect collusion and a static market were assumed in the analysis above. In order to apply our general framework to the RTE cereal industry, these assumptions must be appropriately relaxed. We now proceed to do this, by considering in turn three important questions. First, there is no evidence of explicit agreement among RTE cereal producers to coordinate advertising or brand introduction conduct. Could a pattern of deterrence resembling that described in Section III have arisen in the absence of such coordination? Second, demand patterns for RTE cereals have not remained constant, established firms have engaged in marketing and other research, and they have introduced numerous new brands in the post-war period. Within our framework, how could the entry of new firms have been deterred, even though established firms found it profitable to launch new brands? Third, is the explanation advanced here for the lack of entry during the 1950's and 1960's consistent with the appearance of new firms in the natural cereals segment of the market in the early 1970's?

In the 1950-1972 period, leading producers of RTE cereal did not use price with any frequency as an instrument of rivalry. List price cuts and trade deals were rare. Further, the leading firms did very little private label production and on several occasions refused private label business. (In the 1970's, non-respondent Ralston has deviated from this pattern.) Since private label brands compete through price, avoidance of private label production served to protect a profitable price structure. Without mutual avoidance of hard price competition, of course, the industry's high profits could not have been maintained. Suppression of non-price rivalry was apparently less complete. The heavy use of in-the-package premia in the early 1950's ended abruptly in the middle of that decade. The leading firms monitored each others' advertising spending patterns closely, even exchanging detailed information through Neilson until 1972. This monitoring presumably served to mitigate temptations to increase advertising outlays drastically, though advertising was heavily used by any standards throughout the post-war period.²⁵ No evidence of any attempt to control or restrain new product introductions has been discovered.

Overall, the observed pattern of conduct in the RTE cereal market seems consistent with received doctrine about highly concentrated industries in which products are differentiated:²⁶ price competition is suppressed, and rivalry is channelled into advertising and new product introduction. In game-theoretic language, while pricing conduct may have been approximately cooperative, advertising was probably noncooperative, and new brand introduction activity was almost surely noncooperative.

The implications of noncooperative brand introduction have received considerable attention in models of spatial competition. Hotelling [1929] argued that there would be a tendency for uncoordinated, perfectly mobile sellers to cluster in equilibrium, rather than to disperse themselves to match the distribution of buyers. Early analyses by Lerner and Singer [1937] and Smithies [1941] showed that Hotelling's argument depended critically on strong demand assumptions.²⁷ A number of

recent studies have made the more plausible polar assumption of complete immobility and have considered sequential, uncoordinated entry of one brand firms in various spatial models.²⁸ Studies by Peles [1974], Eaton and Lipsey [1975], Hay [1976], Rothschild [1976], Salop [1976], and Prescott and Visscher [1977] have shown that under a variety of assumptions, each firm's rational concern with subsequent entry near its own single brand leads to dispersion, not clustering, in such cases. The general result that emerges is that brands are located far enough away from established rivals so that demand is sufficient to permit excess profits, but not so far away that profits will be eliminated by subsequent intermediate entry. In fact, Salop [1976] has presented a formal model in which uncoordinated entry by single-brand firms leads to precisely the same configuration of brand locations as would perfectly coordinated entry deterrence via brand proliferation. Section C of the Appendix shows that if the monopoly price is maintained, the circular model introduced in Section III also has this implication.

In short, the spatial competition literature indicates that uncoordinated, non-cooperative brand introduction rivalry can lead to a pattern of brand locations in economic space much like that which would emerge from collusive action to deter the entry of outsiders. The basic reason is that each firm selfishly positions its brands so that new launches by insiders cannot erode its profits. If those profits can then be maintained by avoidance of post-introduction rivalry, in particular by avoidance of intense price competition, a pattern much like the collusive deterrence equilibrium of Section III emerges. It thus seems plausible that such a pattern emerged in the RTE cereal industry as an unforeseen, but presumably not unwelcome, consequence of a mode of behavior that arose more or less naturally from the industry's structure.

Moreover, a pattern of rivalry focusing on advertising and new brands, and avoiding price competition, seems likely to be self-reinforcing once established.

The more effectively established brands are differentiated, the less incentive any seller would have to engage in price competition. The less price competition among established sellers, the greater the typical price-cost margin, and the greater the incentive to advertise. To the extent that advertising outlays resemble fixed costs, increased advertising intensity not only has the direct entry deterring effect noted below equation (8), above, but it increases the asymmetry between the positions of potential entrants and established sellers.²⁹ The latter's brands will be kept on the market as long as variable costs are covered, while an entrant will only launch if it can expect to cover total costs. The greater the difference between variable and total cost, then, the less attractive aggressive price-cutting entry appears.

Finally, a prolonged period of heavy advertising during which multiple brands are available might well affect individuals' perceptions of RTE cereals, making them more sensitive to small differences among actual and potential competing brands. In terms of the circular model of Section III, advertising might increase α as well as A. In Section D of the Appendix, it is shown that if the relative increase in α exceeds that in A, the attractiveness of brand proliferation is enhanced, since the relative increase in profits at a deterrence equilibrium exceeds that at the unconstrained monopoly equilibrium. Conscious or unconscious recognition of these long-run effects would tend to inhibit any efforts on the part of established sellers to reduce advertising and brand introduction rivalry, especially in the face of exceptionally healthy profits.

Let us now turn to the second of the questions posed at the start of this Section: if the established firms found new introductions to be profitable during the 1950's and 1960's, why didn't outsiders? In order to deal with this question, one must consider situations in which the density of demand at various locations in economic space is changing over time, and in which there are costs associated with learning about the demand distribution. In such an environment, opportunities for

profitable new brand introductions will be created from time to time. Some of these may be discovered by firms' research efforts. As long as demand is reasonably stable, the number of new opportunities visible to any set of firms in, say, any one year, will not be large relative to the total number of brands on the market.³⁰ If at some instant all the relevant economic space was crowded by the brands of established sellers, most of it will then remain immune to entry for some time. A deterrence equilibrium of the sort described in Section III, once established, will continue to protect against entry into already exploited regions of product space. Further, under assumptions descriptive of the RTE cereal industry, the established sellers will generally be the ones to take advantage of new opportunities. There are two basic reasons why the research outlays necessary to locate such opportunities will be more attractive to established firms than to potential entrants.

The first was stated somewhat obliquely in a Lancastrian context by Archibald and Rosenbluth [1975] and presented quite clearly in a spatial model by Eaton and Lipsey [1976b].³¹ For concreteness, consider a one-dimensional model, and suppose demand in a segment (of a line or circle) between two established brands is growing in a fairly regular manner. Suppose this situation is known to some established firms and to some potential entrants. In a highly concentrated market, with a few sellers of multiple brands, it is natural to assume that the owners of the two brands bordering the segment in question have reached a tacit understanding not to react to new entry with intense price competition nor, presumably, to respond with ruinous promotional spending. Further, since they face one another as direct competitors at various points in the market, it is natural to assume that this understanding includes at least some of the other established sellers as well.

But, in the absence of an overt and unlikely conspiracy, no potential entrant can possibly be party to this understanding. Any outsider must thus be less certain than at least some established firms about what reception would greet a new

brand he sought to establish in the segment. Any uncertainty of this sort means that at any point in the segment's growth, the expected value of a new brand therein is less to potential entrants, even assuming identical costs, than to established sellers party to the understanding.³² This difference in value means that some established firm will find it profitable to launch a new brand in the growing segment before any potential entrant sees it as large enough to support its brand. And once the established firm has introduced its brand, both its existing and potential rivals are pre-empted until considerable further growth occurs. In short, all other things being equal, existing firms that have established a modus vivendi with their major rivals possess an asset that makes profitable introduction of new brands in segments that would not attract outside firms. Outsiders can thus be repeatedly pre-empted by profitable insider introductions.³³

A second reason why new brands tend to be launched by existing firms stems from the apparent fact that minimum efficient firm size in the RTE cereal industry is a multiple of minimum efficient brand size. Suppose that, somehow, a potential entrant comes to believe with certainty that any new brand it introduced would be given exactly the same reception as a new brand introduced by an established seller. As before, suppose a single growing segment is observed by several established and potential producers. If the established sellers have attained efficient firm size, their costs for a new brand in the segment would be lower than those of any potential entrant, for which the new brand would be its first and only RTE cereal. Again, the growing segment will become attractive enough to provoke introduction by a low-cost (on the margin) established firm before it attracts any potential entrant, and the latter will be pre-empted.

Further, scale effects at the firm level imply that existing firms can actually afford to be somewhat less well-informed or aggressive than outsiders about market opportunities. The rough numbers given in Section I suggest that any potential

entrant would need to capture at least 3% of the market in order to produce efficiently, while an existing firm might well be happy with a new brand that attained a 1% share. The existing firms can thus overlook several opportunities for brands that would be profitable for themselves without provoking entry. An entrant, on the other hand, is faced with the task of either developing a single brand that will exceed a 3% share (not a feat performed often in this market),³⁴ or finding three or four "normal-sized" opportunities and successfully taking advantage of all of them before the existing firms pre-empt any.³⁵ The potential entrant's research task is clearly distinctly harder than those of established sellers.

Since the returns to product development activities are not predictable ex ante, it is certainly likely that established firms will from time to time uncover opportunities that would have been attractive to an entrant ex post. This may well have happened in the RTE cereal market; one can point to small sets of unusually successful new products which might well have supported viable entry. This does not mean that potential entrants were irrational. The arguments above indicate that their expected payoff from research was distinctly below that of established firms, even though among the possible outcomes from such research would have been a very successful new product. Given the barriers that faced them, a decision not to invest substantial sums in attempts to find and exploit such opportunities was probably perfectly rational.

We can now turn to our third question: is the basic theory presented here consistent with the entry into "natural cereals" that occurred in the early 1970's? The last few paragraphs argued that as long as established firms did not overlook substantial market opportunities visible to others, entry deterrence through brand proliferation could be maintained even in the face of demand shifts. But what if established sellers are slow to notice or to react to important developments? Eaton and Lipsey [1976b, p. 26], dealing with an explicitly geographical model, put the

basic answer well:

If either markets grow unexpectedly, or the change comes to be expected only at a time at which new entry is already profitable, the market is "up for grabs" and a scramble may ensue between new entrants and existing firms.... This leads to the general prediction that the more stable and easily predictable is market growth... the more will the expanding market be served by new branches of existing firms, while the more erratic and unpredictable is market growth ... the greater the possibility of new firms entering to serve part of the expanding market.

The evidence suggests that the shifts in consumer tastes that raised the demand for natural cereals in the early 1970's were not well anticipated by most of the established firms. As a result, a substantial new market segment was "up for grabs." Existing proliferation is powerless to deter entry into substantial new segments, as the brands are by definition in the wrong places. Without natural cereal brands in place, the only possible threat of the established firms would have been to crowd the segment whether or not entry occurred. This warfare threat, like similar ones analyzed above, must generally lack credibility, even if it can be effectively communicated. It is hardly surprising, given the RTE cereal industry's record of profitability, that entry occurred under these circumstances.

The established sellers also introduced natural cereals, and the segment as a whole has declined. Only one of the entrant firms (Pet) still has an RTE cereal product in national distribution. The industry's history thus suggests that unless the frequency of large unanticipated demand shifts rises dramatically, effective entry deterrence is likely to be maintained indefinitely in the absence of corrective outside intervention.

V. WELFARE PROPERTIES OF ALTERNATIVE EQUILIBRIA

The analysis to this point indicates that the RTE cereal industry's basic demand and cost conditions have interacted with a pattern of conduct emphasizing brand introduction rivalry to produce a situation in which high profits are not eliminated by rivalry among existing sellers and are not threatened by rivalry from potential entrants. This Section applies the tools of welfare economics to see what can be done about this in principle. It will be argued that even though brand introduction and advertising are the most conspicuous aspects of conduct in this market, intervention should focus as directly as possible on pricing and conditions of entry.

Let us temporarily assume that no matter what changes are made in the industry, the pattern of introductory and maintenance advertising spending per brand will remain unaffected. We can then take brands' cost functions as fixed. The basic welfare theoretic problem in situations of this sort was recognized and discussed long ago by Chamberlin [1953, 1962]. On the one hand, the more brands that are offered for sale, the better the market caters to the diversity of consumer tastes. On the other hand, with increasing returns at the brand level, more brands generally imply higher average costs. The problem of optimizing such an industry's organization from a social point of view is complicated by the fact that price will generally exceed marginal cost. Recent studies by Stern [1972], Willig [1973], Spence [1976a, 1976b], Salop [1976] and Dixit and Stiglitz [1977] have examined this problem under a variety of assumptions, but no simple workable prescriptions have emerged.

We can illustrate the nature of these analyses and of the difficulties they encounter by employing our illustrative cost function (1) and demand function (5), thus restricting our attention to long-run comparisons in which all brands are optimally located.³⁶ The usual index of social welfare in these studies is the sum of consumers' surplus and producers' excess profits. Under our assumptions, this can be written as³⁷

$$(9) \quad W(p, N) = \int_p^{\infty} Nb(N)a(x)dx + V(p, N).$$

The partial derivatives of this welfare indicator are given by

$$(10a) \quad W_p = Nb(N)(p-v)a'(p),$$

$$(10b) \quad W_N = [Nb'(N) + b(N)][A(p) + \int_p^{\infty} a(x)dx] - F = M(N)G(p) - F,$$

where the last equality serves to define the functions $M(N)$ and $G(p)$. We assume $Nb(N)$ increasing and strictly concave, so that there are diminishing returns to additional brands and $M(N)$ is strictly decreasing. Similarly, as long as $a(p)$ is decreasing and $p > v$, $G(p)$ is strictly decreasing. Since W_p has the sign of $(v-p)$, it is clear that marginal cost pricing is optimal for any N . With $p = v$, the welfare optimal N , N^W , is obtained by solving (10b). While the (p, N) pair (v, N^W) is socially optimal, it does not permit fixed costs to be covered and thus does not represent a feasible outcome in most situations.

The welfare implications of a number of other (p, N) pairs can be considered. We have already defined the monopoly and deterrence points, (p^m, N^m) and (p^m, N^d) . Let N_0^m be the number of brands just sufficient to drive profits to zero when $p = p^m$, and let N_p^w be the number of brands that maximizes W subject to the constraint that $p = p^m$. If one takes the deterrence equilibrium as a first approximation to the RTE cereal industry's current situation, intervention that focused on brand introduction and ignored pricing would aim for the point (p^m, N_p^w) . Finally, let (p_π^w, N_π^w) be the solution to the problem of maximizing W subject to the constraint that V be non-negative. This is also a second-best equilibrium. Section E of the Appendix establishes that the zero-profit constraint is binding and that $v < p_\pi^w < p^m$.

It is also shown there that the following inequalities relate the numbers of brands in the various equilibria:

$$(11a) \quad N^m < N^d < N_0^m,$$

$$(11b) \quad N^m < N_p^w,$$

$$(11c) \quad N^m < N^w,$$

$$(11d) \quad N_\pi^w < N^w,$$

$$(11e) \quad N_\pi^w < N_0^m.$$

Further, these would seem to be the only inequality relations among the N's that hold in general in this model.

If price is fixed at the monopoly level, (11b) implies that it is optimal to increase N beyond the unconstrained profit-maximizing point. The intuition is that each additional brand increases consumers' surplus, and until the last brand subtracts as much from profits as it adds to surplus, further brands are optimally added. But it is apparently possible for N_p^w to fall short of N^d or to exceed N_0^m . Inequalities (11) do not support a charge that the deterrence equilibrium involves too many brands in any well-defined sense, nor do they suggest that intervention focusing on N is likely to increase welfare. (If the status quo point were unconstrained monopoly, it would be clear that the number of brands should be increased, even if pricing could not be affected.)

A number of inequalities relating values of W at the various equilibria are obvious from the definitions of those equilibria. In addition, Section E of the Appendix establishes the following:

$$(12a) \quad W(p_\pi^w, N_\pi^w) > W(p^m, N_0^m),$$

$$(12b) \quad W(p_\pi^w, N_\pi^w) > W(p^m, N^d).$$

The first of these simply points out that if profits are to be driven to zero, it is best to do this with a price below the monopoly level. The second inequality shows that the optimal zero profit point is strictly better than the deterrence

equilibrium. Since excess profits are zero by construction at (p_{π}^w, N_{π}^w) , it follows a fortiori from (9) that consumers are better off than at (p^m, N^d) .

Suppose, based on the analysis of the preceding two Sections, we take the deterrence equilibrium as an approximate description of the state of the RTE cereal industry. Then (12b) suggests that if prices could be lowered by the correct amount, and if entry eliminated excess profits, social welfare would increase. This sort of implication follows from other formal models, as does the following difficulty. The pair (p_{π}^w, N_{π}^w) was found as the solution to a reasonably complicated constrained optimization problem. Without the kind of complete information that is unlikely ever to be available in practice, one can establish little beyond the fact that p_{π}^w is less than p^m . While we know from (12b) that some increase in price competition, coupled with free entry, would be optimal, we thus cannot say in any operational way how much additional price competition is best. Nor does it seem possible to devise simple policies that would be certain to drive the market to exactly this optimal point. It does not seem possible to show that all zero-profit points lead to a higher W than the deterrence point; this can only be shown with certainty for points "close to" (p_{π}^w, N_{π}^w) . In short, we cannot prove rigorously that all increases in price competition coupled with free entry would serve to increase W ; we have only shown that some range of increases will do this.

Still, the foregoing analysis does have some useful implications. To the extent that (p^m, N^d) and (p_{π}^w, N_{π}^w) correspond to the current and best feasible equilibria in the RTE cereal market, the arguments above imply that the basic problem with seller conduct in that market is not that too many brands are introduced. It is rather that too little price competition is present. Consumers would benefit directly from lower prices, but as the industry is currently structured, these are not likely to be forthcoming from established sellers, nor are they likely to be induced by new entry. Further, intervention that seeks to enhance price competition and facilitate

entry at least has the potential for raising welfare, as measured by $W(p,N)$. Actions that would focus directly on brand introductions or advertising spending do not have this property; there is no rigorous way even to establish the desired directions of change in these variables.

Two additional considerations not incorporated in the formal analysis above lend additional support to this policy prescription. First, the welfare function in (9) gave the same weight to a dollar of benefits enjoyed by consumers as to a dollar of excess profits received by producers. In fact, many would argue that consumer benefits are socially more valuable than excess profits received by producers. If a greater weight is thus placed on the first term on the right of (9) than on the second, the attractiveness of all points at which excess profits are zero is enhanced. In particular, the set of prices that (coupled with free entry) guarantee an increase in welfare is expanded. In short, the less value society places on excess profits enjoyed by producers, the less the danger than any particular increase in price competition will fail to be desirable.

Second, at the outset of this Section it was explicitly assumed that brand-specific costs were unalterable. But, as we have repeatedly emphasized, a large fraction of those costs over the life-cycle are advertising expenditures. Advertising costs are conduct-determined to a considerable extent. Greater price competition would lower the spread between price and marginal production costs, thus lessening the value of additional sales and, correspondingly, reducing the incentive to advertise. Lower advertising by established brands should serve to reduce somewhat the required level of introductory spending. This may serve directly to facilitate new entry. Further, if one feels that the current intensive use of advertising in this industry is not justified as a response to consumer demand for information, or if one objects to the sizeable fraction of that advertising directed at children, one should draw comfort from the fact that increased price competition can be expected to reduce these outlays.

VI. THE IMPACT OF PROPOSED RELIEF

The remedy proposed by complaint counsel in the RTE cereal litigation has four substantive components, of which two are of primary importance: divestiture and trademark licensing.³⁸ The proposed divestiture would create five new firms, by requiring the three largest respondents to divest themselves of certain established plants and trademarks.³⁹ The licensing remedy would require the three largest respondents to license their existing trademarks (and to provide the corresponding formulae) on a royalty-free basis to all non-respondent firms willing to meet quality control standards. In addition, similar licenses would be required to be made available on new brands introduced by the "big three" five years after their introduction. All such licenses would be limited in duration, so that trademarks would eventually revert to the originating firm. The remainder of this final Section examines these provisions in the light of the foregoing analysis and argues that the proposed relief is quite likely to improve the RTE cereal industry's performance.

Divestiture will have the obvious immediate effect of producing a less concentrated structure, though the four largest firms will still account for over half the industry's sales. One can expect this fall in concentration directly to increase the extent of price competition in the industry. Moreover, one might expect an indirect increase via private labeling. Respondents are clearly reluctant to engage in private label production at present. Given the industry's high concentration, this reluctance likely derives in large part from fear that private labeling would be viewed by major rivals as a form of aggressive price competition. Deconcentration can be expected to weaken, at least to some extent, the tacit agreement that supports this mutual reluctance to rock the boat. If private labeling activity is thus increased, the boat will be rocked, and pressure on prices generally seems likely to appear. Finally, increased price competition from any source, by

narrowing margins over production costs, will tend to reduce the incentive to engage in rivalry via brand introduction and heavy advertising. The analysis above suggests that reductions in these dimensions of rivalry among established sellers are likely to have the desirable effect of facilitating entry of new competition.

Still, the proposed divestiture may not be itself constitute an adequate remedy. While deconcentration can be expected to increase the intensity of rivalry, it might not serve to focus rivalry on price to the necessary extent. The industry would still be relatively concentrated; products would still be differentiated. If the industry is to move toward a low-price, low-profit equilibrium, a change in the "rules of the game" must be induced. Trademark licensing would operate in this direction.

The proposed licensing requirement can be expected to have a variety of impacts on the industry's conduct and performance. First, it places the three largest sellers at a disadvantage relative to other existing and potential producers, so it can be expected to reinforce the deconcentration effects of divestiture.

Second, this component of the remedy should have a strong direct effect on price competition. Non-respondent firms will be able to produce products, which we shall call "copies" for convenience, that can be truthfully promoted as identical to respondents' established brands. There is no reason to suppose that non-respondents will have access only to inferior production and marketing technology. They will not need to engage in the usual level of introductory advertising in order to establish such copies in economic space; this purpose should be accomplished in large measure by the use of already established trademarks. If copies are produced by firms with established reputations in prepared foods or marketed by large grocery chains, the issue of differential firm reputation need not arise in buyers' minds. The licensing component of the remedy should thus produce a situation in which at least the largest established RTE cereal brands are offered for sale by more than

one firm, and price competition seems virtually certain to erode the margins on those brands. Lower prices for the largest brands seems likely to force reductions in the prices of other (non-licensed) brands.

Third, trademark licensing will directly expand the options available to potential entrants and thus serve to facilitate entry. Outsiders will be able to gain a toehold in the industry by producing copies of leading brands. Since parity on quality terms can be attained (and, if desired, advertised), this will be more attractive than private labeling is now. Once a firm has attained efficient scale in this fashion, it will be favorably positioned to launch its own brands, should that appear profitable.⁴⁰

Fourth, the provision that new brands of the top three firms must be licensed royalty-free after five years should directly reduce the incentive to engage in brand introduction rivalry. This reduction should help to prevent the re-emergence of entry deterrence via brand proliferation. Because the period of exclusive ownership of a trademark will be reduced from its present infinite length, the rewards from new brand introduction will be reduced. Society has determined that infinity is too long for the life of a patent.⁴¹ Similarly, in the RTE cereal industry, in which new brand introductions both add directly to consumers' search costs and are the main component of a pattern of conduct that seems to have effectively deterred new entry and protected excess profits, infinity is probably too long for the life of a trademark. Some shorter trademark lifetime, such as the proposed five year period, seems likely to improve performance.⁴²

An important interaction effect between these two components of the proposed relief should also be mentioned. In order for trademark licensing to have its desired effect, there must be a set of firms well situated to take out licenses. The proposed divestiture order would create just such a set of firms.

To summarize, the proposed relief seems likely to facilitate entry, to increase price competition, and to reduce directly and indirectly the incentive to proliferate new brands and to advertise heavily. As RTE cereals are produced by real firms, not textbook simplifications, operating in a complex environment, one cannot prove with mathematical certainty that the structural changes that would be produced by the proposed remedy will induce these changes in conduct. But we have attempted to show in this Section that the basic economics of the situation make it quite probable that conduct will change as indicated. Similarly, as was noted in Section V, we cannot prove with mathematical certainty that these changes in conduct will raise conventional measures of social welfare. But we argued there that the conduct changes that the proposed relief seems quite likely to induce are precisely the sort of changes that are most likely to improve the industry's performance. The proposed relief thus seems to provide a solution to the problem in normative economics posed by the RTE cereal industry's poor performance.

APPENDIX

Section A

The first-order conditions for unconstrained maximization of $V(p, N)$, as given by equation (6), are as follows:

$$(A.1a) \quad A'(p)Nb(N) = 0,$$

$$(A.1b) \quad A(p)[b(N) + Nb'(N)] - F = 0$$

Note that we employ the usual assumption that N can be treated as continuous without substantial error. Condition (A.1a) clearly implies $A'(p^m) = 0$. The corresponding first-order conditions for maximization of $V(p, N)$ subject to $\pi(p, \gamma N) \leq 0$, assuming the constraint strictly binding, are as follows:

$$(A.2a) \quad A'(p)[Nb(N) - \lambda b(\gamma N)] = 0$$

$$(A.2b) \quad A(p)[b(N) + Nb'(N) - \lambda \gamma b'(\gamma N)] - F = 0$$

$$(A.2c) \quad A(p)b(\gamma N) - F = 0,$$

where λ is a Lagrange multiplier, which can be shown to be positive, and (A.2c) simply re-states the constraint.

Two types of solutions to conditions (A.2) might seem possible. In brand proliferation solutions, (A.2a) is satisfied by $A'(p) = 0$, so that $p = p^m$. Given p , the value of N is obtained from (A.2c), and (A.2b) merely serves to determine λ . This solution implies $N^d > N^m$ if the constraint is binding. In limit pricing solutions, the term in brackets in (A.2a) is zero and $A'(p) \neq 0$. This gives one equation in N and λ :

$$(A.3a) \quad Nb(N) - \lambda b(\gamma N) = 0$$

A second such equation is obtained by solving (A.2b) and (A.2c) for $F/A(p)$ and setting the resultant expressions equal:

$$(A.3b) \quad b(N) + Nb'(N) - \lambda \gamma b'(\gamma N) - b(\gamma N) = 0$$

If these two equations could be solved for N and λ , p would then be determined from (A.2c). We now show that limit pricing solutions do not exist, since concavity of $Nb(N)$ implies that (A.3a) and (A.3b) have no solution.

If a solution to these equations existed, we could substitute for λ in (A.3b) from (A.3a) to obtain

$$(A.4) \quad T = b(N)b(\gamma N) + Nb'(N)b(\gamma N) - b(\gamma N)^2 - b(N)\gamma Nb'(\gamma N) = 0$$

Concavity of $Nb(N)$ can be readily shown to imply

$$(A.5a) \quad Nb'(N) \geq [\gamma/(\gamma-1)][b(\gamma N) - b(N)],$$

$$(A.5b) \quad \gamma Nb'(\gamma N) \leq [1/(\gamma-1)][b(\gamma N) - b(N)].$$

Equality holds in both of (A.5) if $Nb(N)$ is constant. Substitution of (A.5) into the expression for T and some algebra yield

$$(A.6) \quad T(\gamma-1) \geq [b(N) - b(\gamma N)]^2 > 0.$$

Thus T is positive for all N , and no solution to equations (A.3) exists.

Since $A'(p) = 0$ at both monopoly and deterrence equilibria, only shifts in the function $A(\cdot)$ can affect p . In particular, as long as $A(\cdot)$ is strictly concave and $a(\cdot)$ is decreasing, increases in v raise $p^m = p^d$. Equation (A.1b) can then be used for further comparative statics in the monopoly case, while (A.2c) can be employed for deterrence equilibria. If " \sim " is taken to mean "has the same sign as," straightforward differentiation then establishes that our assumptions imply the following:

$$(A.7a) \quad dN^d/dF \sim dN^m/dF < 0,$$

$$(A.7b) \quad dq^d/dF \sim dq^m/dF < 0,$$

$$(A.7c) \quad dN^d/dv \sim dN^m/dv < 0,$$

$$(A.7d) \quad dN^d/dD \sim dN^m/dD > 0,$$

where D is a multiplicative demand shift parameter;

Section B

If equation (5) is replaced by equation (8), conditions (A.2) are still necessary for an internal deterrence equilibrium, except that $A'(p)$ in (A.2a) and $A(p)$ in (A.2b) and (A.2c) must be multiplied by $d(F)$. An additional first-order condition must be added to the list:

$$(B.1) \quad N[A(p)b(N)d'(F) - 1] - \lambda[A(p)b(\gamma N)d'(F) - 1] = 0$$

Since λ is positive when the constraint is strictly binding, the two terms in brackets must be of the same sign. Since $b(N) > b(\gamma N)$, they cannot both be zero.

It is easy to show that (A.3b) holds at a deterrence equilibrium with demand equation (8). Equation (A.3b) can be re-arranged as follows:

$$(B.2) \quad [(\lambda/N) - 1]\gamma b'(\gamma N) = [b(N) - b(\gamma N)]/N + [b'(N) - \gamma b'(\gamma N)].$$

Inequalities (A.5) can be combined to establish

$$(B.3) \quad [b'(N) - \gamma b'(\gamma N)] \geq [b(\gamma N) - b(N)]/N.$$

Substitution of (B.3) into (B.2) then yields

$$(B.4) \quad [(\lambda/N) - 1]\gamma b'(\gamma N) \geq 0.$$

Since $b'(\gamma N) < 0$, it follows that $\lambda \leq N$.

Now suppose that both bracketed terms in (B.1) are positive. The result of the preceding paragraph then implies

$$(B.5) \quad N[A(p)b(N)d'(F) - A(p)b(\gamma N)d'(F)] \leq 0.$$

But this is impossible, since both quantities in the bracketed expression are positive, and $b(N) > b(\gamma N)$. Thus both bracketed terms in (B.1) must be negative. But the first term in (B.1) is just the partial derivative of the profits of the established brands with respect to F . Its negativity and the strict concavity of $d(\cdot)$ establish that those profits could be increased by reducing F (and thus obviously making entry attractive), as was to be shown.

Section C

In sequential entry models, independent brands are assumed to enter one at a time and to take as given the locations of earlier entrants and the rational behavior of subsequent entrants. Suppose that one brand is in position on the circle. With price fixed at the monopoly level, the profits that the second brand to enter expects to derive from the interval between it and the first brand are an increasing function of the length of that interval - unless the interval is so long that subsequent price-matching entrants will find it profitable to locate there. Thus the second brand to enter will locate as far as possible away from the first brand, subject to the constraint that subsequent intermediate entry not be profitable. Assuming that entry of the second brand is profitable and that two brands on opposite sides of the circle would not render entry of a third brand unprofitable, that constraint must be binding.

Suppose brand 2 optimally locates $2d$ to the right (or left) of brand 1. A subsequent price-matching entrant midway between them would sell to buyers as far as $(d/2)$ away on its right and on its left. Using the notation in the text and the demand relation (2), its profits would be given by

$$(C.1) \quad \pi' = A(p^m)[d - (\alpha d^2/4)] - F,$$

where p^m is the monopoly price, defined by $A'(p^m) = 0$. By the argument in the preceding paragraph, d must be chosen so that $\pi' = 0$. But the same reasoning holds for the third brand to enter, for the fourth brand, and so on. Neglecting integer problems, entry will cease when all brands are separated by intervals of length $2d$. Since the circle is of unit circumference, the number of brands, N , will equal $1/2d$. Substituting into (C.1) and setting $\pi' = 0$, it follows that N is given by the solution to

$$(C.2) \quad A(p^m)(8N - \alpha)/16N^2 - F = 0.$$

But from (4) in the text, the right-hand side of (C.2) is just $\pi(p^m, 2N)$. It then follows from Section A above that the solution to (C.2) is exactly the N that would be chosen by a monopoly seeking optimally to deter entry.

Section D

In the circular model of Section III, let A^* be the maximized value of $A(p)$. Total profits of the established brands are given by $V(p, N) = N\pi(p, N)$, where $\pi(p, N)$ is given by (4) with $A = A^*$. The unconstrained maximum of V is easily shown to be

$$(D.1) \quad V^m = A^*[1 - \sqrt{Z}] \equiv A^*f(Z), \text{ where}$$

$$(D.2) \quad Z \equiv \alpha F/A^*,$$

and the second equality in (D.1) defines $f(Z)$. At a deterrence equilibrium in this model, $V(p, N)$ is maximized subject to the constraint $\pi(p, 2N) \leq 0$. This constraint is binding for $Z \leq .640$, and at such an equilibrium the total profits of the established brands are given by

$$(D.3) \quad V^d = A^* \left\{ 1 - \left[\frac{Z}{1 + \sqrt{1-Z}} + \frac{1 + \sqrt{1-Z}}{4} \right] \right\} \equiv A^*g(Z),$$

where the second equality defines $g(Z)$.

Suppose now that advertising changes A^* by a small amount ΔA^* and shifts α such that Z changes by a small amount ΔZ . Let the resultant changes in V^m and V^d be ΔV^m and ΔV^d , respectively, and suppose $\Delta V^m = \theta V^m$. Differentiation and substitution then establish

$$(D.4) \quad \Delta V^d = \theta V^d + [A^*/f(Z)][g'(Z)f(Z) - g(Z)f'(Z)]\Delta Z.$$

The difference in brackets is a messy function of Z ; numerical evaluation shows it to be positive for $0 \leq Z < .640$. If A and α increase because of advertising, but the percentage increase in α is larger, ΔZ will be positive. It then follows from (D.4) that the percentage increase in V^d will exceed that in V^m , as was asserted in

the text. It also follows that while increases in F lower both V^d and V^m , the latter falls more in percentage terms. The intuitive reason is that (F/A^*) can be thought of as a measure of the importance of the nonconvexity upon which deterrence rests.

Section E

Let us first give the conditions that determine N under the various assumptions indicated in the text. From (10),

$$(E.1) \quad M(N^W) = F/G(v).$$

From (A.1b) and (A.2c),

$$(E.2) \quad M(N^m) = F/A(p^m), \text{ and}$$

$$(E.3) \quad b(\gamma N^d) = F/A(p^m).$$

From (10b), $G(p) > A(p)$ at any price at which purchases are made. Assuming the deterrence constraint is binding, $b(\gamma N^m) > M(N^m)$, and we shall assume that this inequality holds for all N . From the relevant definitions,

$$(E.4) \quad b(N_0^m) = F/A(p^m).$$

Note that $b(N) > b(\gamma N)$ for all N . From (10b),

$$(E.5) \quad M(N_p^W) = F/G(p^m).$$

Finally suppose $W(p, N)$ is maximized subject to the constraint that $V(p, N)$ be non-negative. Since (10a) implies $W_p < 0$ for $p > v$, and since the constraint cannot be satisfied at $p = v$, the constraint must be binding. The first-order conditions can be written as follows:

$$(E.6a) \quad A(p)b(N) - F = 0,$$

$$(E.6b) \quad (p-v)a'(p) + \lambda A'(p) = 0,$$

$$(E.6c) \quad M(N) = F[1 + \lambda]/[G(p) + \lambda A(p)],$$

where λ is a positive Lagrange multiplier. Condition (E.6a) simply restates the constraint. Condition (E.6b) can easily be seen to imply that the optimal constrained price, p_{π}^w , satisfies $v < p_{\pi}^w < p^m$. Eliminating λ between (E.6b) and (E.6c), we obtain

$$(E.7) \quad \begin{aligned} M(N_{\pi}^w) &= F/\{[G'(p_{\pi}^w)I(p_{\pi}^w)/a(p_{\pi}^w)] + G(p_{\pi}^w)\} \\ &= F/\{[A'(p_{\pi}^w)I(p_{\pi}^w)/a(p_{\pi}^w)] + A(p_{\pi}^w)\} = F/H(p_{\pi}^w) \end{aligned}$$

where the last equality defines $H(p)$, and $I(p)$ is the integral appearing in (10b). We have immediately that for $p > v$, $H(p) < G(p)$, since $G(p)$ is decreasing in the relevant range. Since G is decreasing, it also follows that $H(p_{\pi}^w) < G(v)$.

Of inequalities (11) in the text, only (11e) does not follow immediately from the results of the preceding two paragraphs. To prove that $N_{\pi}^w < N_0^m$, it suffices to observe that both (p_{π}^w, N_{π}^w) and (p^m, N_0^m) satisfy (E.6a). But by definition, $A(p^m) > A(p_{\pi}^w)$, since $p^m \neq p_{\pi}^w$, and the result follows from $b'(N) < 0$.

To establish (12a), note that both (p_{π}^w, N_{π}^w) and (p^m, N_0^m) satisfy the zero profit constraint. The first point yields a maximum of W subject to that constraint. But the second point satisfies an additional restriction that the first does not: $p \geq p^m$.

The proof of (12b) is as follows. Let $\bar{V} = V(p^m, N^d) > 0$. Suppose W is maximized subject to the constraints $p \geq p^m$ and $V(p, N) \geq \bar{V}$. The solution will be some point (p^m, N') such that $W(p^m, N') \geq W(p^m, N^d)$. Now consider a second optimization problem, formed from this first one by dropping the first constraint entirely and relaxing the second by replacing \bar{V} with zero. As noted above, $W_p(p^m, N) < 0$. Thus the dropped constraint was strictly binding, so its removal must raise the optimal value of the objective function. Replacing \bar{V} with zero expands the feasible set and cannot lower optimal W . But the second problem is precisely the one that led to the point (p_{π}^w, N_{π}^w) , so that $W(p_{\pi}^w, N_{\pi}^w) > W(p^m, N') \geq W(p^m, N^d)$, and the proof is complete.

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FOOTNOTES

1. F.T.C. v. Kellogg, et al, Docket No. 8883. Nabisco and Ralston-Purina, the fifth and sixth largest firms in the market, were mentioned in the complaint but not listed as respondents.
2. F.T.C. Docket No. 8883, transcript pages 21671-23935.
3. Since this industry advertises heavily, the accounting treatment of advertising outlays is the most obvious source of such biases.
4. More precisely, following Caves and Porter [1977], there exists some barrier to entry into the group of sellers producing differentiated brands of RTE cereal and marketing them nationally. Small regional producers that advertise little have apparently entered and exited from this industry over the years, but membership in the group of leading sellers was restricted to the six firms named above until the 1970's.
5. The list of attributes considered of course follows Bain [1956]. One non-standard factor, specific to the RTE cereal industry and a few others, should be mentioned at this point. All respondents have for some time offered free advice to retailers about the brands of RTE cereal they should stock and about how these brands should be displayed along the "cereal aisle." Kellogg's is apparently the clearly most important such "shelf space plan." While one can imagine that respondents' advice would be slanted against stocking new entrants' products (and, more importantly, that potential new entrants might expect it to be so slanted), and there is anecdotal evidence suggesting that advice has in fact not always been purely scientific, no very precise picture of the effects of these plans is currently available. In any case, while a practice on the part of established firms of giving free, useful, but slanted advice to retailers might well make potential entrants somewhat more reluctant to enter, it is hard to imagine such plans being powerful deterrence devices.

6. The entry of the 1970's occurred, as was noted above, in the natural segment of the market. There is some indication that the production process for natural cereals is simpler than for other types, so that minimum efficient firm size in this segment may be below the range indicated. Of course, production economies interact with those in distribution and promotion in determining minimum efficient scale. In any case, no estimate of the magnitude of the net difference (if any) between segments is available.
7. One can perhaps go back even a few more years. In retrospect at least, some of Sraffa's [1926, pp. 182-97] language, which Hotelling [1929] cites approvingly, is very suggestive of a spatial model.
8. The sourest and sweetest ciders on the market have only one neighbor each. "End effects" of this sort seem unlikely to be of much importance in markets with many brands, and they will generally be ignored in what follows.
9. See also Kaldor [1934], where the spatial analogy and its implication of overlapping oligopolies are noted.
10. In his text, Vickrey [1963, pp. 323-34] provides a very insightful discussion of the then extant literature on spatial competition.
11. The only explicit criticism of the spatial competition approach to the analysis of differentiation in the recent literature seems to be that of Demsetz [1971]. He faults it for being partial equilibrium in nature and (in the context of differentiation by geographic location) for failing to consider land rents adequately. On these points, see Telser [1971] and Eaton and Lipsey [1976c, note 18].
12. In his important work on product selection, Spence's [1976b] demand assumptions are of the symmetric type, though he has argued elsewhere [1976a] that a Lancasterian framework is appropriate for applied work involving differentiated products. See also the spatial language employed in his [1976b, p. 234] discussion of entry deterrence.

13. One formal difference is that each buyer in a spatial model is assumed to purchase only one brand, while in a Lancasterian model buyers may rationally elect to consume as many brands as there are relevant characteristics. As long as localization is present, however, this makes no real difference to the aggregate demand conditions facing any individual brand.
14. If a new entrant were to charge a price so low that demand for one of the two established brands between which it entered were driven to zero, further price cuts would of course affect an additional brand. (Such price cuts are called "ZAPS" by Salop [1976].) Drastic actions of this type are considered further below, where it is argued that an entrant is unlikely to perform them.
15. For general discussions of such costs within the spatial competition framework, see Vickrey [1963, pp. 323-34], Hay [1976, p. 252], and Prescott and Visscher [1977].
16. Samuelson [1967] does not handle seller mobility in a consistent fashion, as Grace [1970] points out. In his reply to Grace, Samuelson [1970] seems to accept the assumption of fixed locations.
17. The upper bound on α avoids technical complications that arise when some consumers don't buy any of the brands; see Lerner and Singer [1937] and Salop [1976].
18. With one additional assumption, it is easy to show that this functional form and the generalization employed below satisfy the conditions of Willig's [1976] "pure-repackaging" case. Let there be N brands on the market, let the distance around the circle to the i^{th} brand be x_i , and let q_i be the amount of that brand consumed. Let \bar{p} and \bar{z} be vectors of prices and quantities consumed of other goods, and let I be income. Then if the demand function in the text can be expanded as $q(p)f(\bar{p}, I)(1-\alpha x)$, where f is any function, it follows from Willig's [1976] Propositions 3 and 4 that demand for this good is derivable from maximization of a utility function of the form $U[\sum_{i=1}^N q_i/h(x_i), \bar{z}]$, where h is an increasing function.

- (This suggests a natural approach to generalizing the demand structure in the text to cover situations in which brands' prices differ.) The transportation cost model satisfies the conditions of Willig's [1976] "cross-repackaging" case.
19. Location exactly next to an established brand would produce sales of $q(p,N)/2$, whereas location midway between two established brands would yield $q(p,2N)$. Equation (3) implies that $Nq(p,N)$ is non-decreasing in N , which suffices to show that $q(p,2N) \geq q(p,N)/2$. Other locations can be shown to offer no improvement by constructing demand integrals that generalize (2) and choosing location to maximize sales. The intuition is that location at the center of an open interval has the maximum market expansion effect, since buyers at nearby locations were the worst served in the pre-entry situation.
 20. Deterrence equilibria of this sort are explicitly described in one-dimensional models under alternative behavioral assumptions by Eaton [1976] and Salop [1976].
 21. Arguments resembling that of this paragraph have been made for undifferentiated markets by Scherer [1970, pp. 228-9], in the context of spatial models by Hay [1976] and Eaton and Lipsey [1976b], and with reference to a Lancasterian model by Archibald and Rosenbluth [1975].
 22. Established brands that suffered losses because of entry might be withdrawn altogether, of course. But the favored demand positions of established brands ensures that any entrant that imposed losses on an established brand would incur greater losses itself. Should an entrant, for some reason, attempt this sort of warfare, it seems unlikely that established firms would surrender unless they happened to be exceedingly short of liquid funds.
 23. Since the established brands are trademarked and their formulae and production processes are not public knowledge, and since consumers know this, it is presumably impossible for any entrant to occupy exactly the same position as an established brand in the economic space of consumer perceptions. In fact, Willig

[1973, p. 162] suggests that some finite "protected area" around established trademarked brands is immune to entry. (Trademarks thus rule out the sort of de-stabilizing moves referred to as "ZOOMS" by Salop [1976]. See also Eaton [1976] and Eaton and Lipsey [1976c].)

24. For an early discussion of the use of multiple products to deter entry and to protect established lines (with no analysis of the mechanism that might permit this), see Lanzillotti [1954].
25. It is worth noting, however, that one reason why rates of return did not fall in the late 1960's when demand growth ceased is that established sellers made substantial cuts in advertising outlays.
26. See, for instance, Scherer [1970, p. 336].
27. A review of and substantial contribution to this literature is provided by Eaton and Lipsey [1975].
28. As far as I know, only Teitz [1968] has attempted to model formally the noncooperative brand location decisions of firms selling multiple brands, and such results as he obtains depend on very strong assumptions. Vickrey [1963, pp. 323-34] provides an informal discussion of the results of sequential uncoordinated entry.
29. The point that follows is due to Eaton and Lipsey [1976b, p. 24].
30. From 1950 through 1972, the number of introductions of brands into distribution beyond test market averaged about 7% of the number of brands beyond test distribution at the start of the year.
31. See also Vickrey [1963, pp. 323-334] for remarks that bear on this mechanism.
32. It is not being argued that potential entrants believe with certainty that their entry would provoke a predatory response. As long as an entrant's expectations about rival reactions are less optimistic to any degree than those of established firms, the latter will enter first and pre-empt the relevant segment. And as

long as potential entrants agree with Yamey [1972] that predatory reaction to new entry is at least plausible, this difference will exist. This same sort of behavioral disadvantage may face established sellers considering segments bordered by rivals with whom they have not previously established a mutually agreeable pattern of conduct. The smallest established sellers might from time to time be pre-empted for this reason. (See footnote 4, above.)

33. Eaton and Lipsey [1976b] show formally in a particular one-dimensional model that fear of rivalrous reaction would lead a potential entrant considering a brand that would be on the edge of the market to choose an inefficient location, thus further reducing the value of the brand to him.
34. Of the 80-odd brands introduced into distribution beyond test market in the 1950-1972 period by the six leading sellers, only two ever attained a market share above 3% for any year in this period.
35. Multiple brand entry may be indicated by strategic as well as cost considerations. It is at least plausible that a single brand would be more likely to provoke predatory reactions than would multiple brands, since a firm that introduces several brands signals more convincingly its intention to remain in the industry. Potential entrants may thus feel a need to enter developed portions of the market with a full line of cereals in order to become "members of the club" without a period of warfare.
36. That is, if N brands are optimally located, costs of mobility imply that adding another brand will not produce a situation with $(N+1)$ brands optimally located. Given shifts in tastes over time, however, one might expect different patterns of brand introduction rivalry to lead in the long run to situations with different numbers of brands, all at least approximately optimally located.
36. On the welfare function in this particular form, see Willig [1973, 1976] and Spence [1975, 1976b].

38. The other two components are a ban on acquisitions, which serves to make divestiture effective, and a prohibition of the shelf space plans discussed in footnote 5, above. The positive case for eliminating such plans is that they may give the largest established firms advantages over potential entrants and, possibly, their smaller existing rivals. Though, as footnote 5 indicated, the actual and potential effects of these plans are not well understood, it is hard to see what social harm could derive from prohibiting RTE cereal manufacturers from giving free advice. If such advice is worth having, grocers will presumably purchase it from sources less likely to be biased against new entry into the industry. If the advice is worth less than the cost of producing it, it will not be purchased, and resources will be saved.
39. These firms are Kellogg, General Mills, and General Foods.
40. This paragraph and the preceding one have implicitly assumed that licensing will be attractive. It might be possible for existing producers to deter potential licensees in classic limit pricing fashion by substantially reducing prices on the leading brands. Even if this is possible and actually comes to pass, the remedy will have nonetheless served to reduce prices and excess profits -- by means of potential rather than actual price competition. It will thus have attained its major performance objectives.
41. An early, and somewhat extreme, statement of the relation between patents and trademarks was given by Chamberlin [1962, pp. 57-64].
42. This period was derived by reference to the pattern of lifetimes of apparently profitable brands, some but not all of which are on the market for more than five years.